

the chest and back areas, with little or no attention having been given to their overall performance, which in turn has led to several significant drawbacks.

One significant drawback to the safety vests typical of the prior art is that any enhanced visibility effect occurs mostly in a direction extending directly ahead of or behind the wearer. The prior safety vests provide little if any enhanced visibility in the side directions. This can lead to a false sense of confidence by the wearer that he/she is visible to all approaching traffic. In other words, the wearer may perceive that his/her safety vest provides enhanced visibility in all directions, when in reality it is quite directional with little if any enhanced visibility from the side. This in turn can lead to dangerous situations with life-threatening consequences, such for instance in the case of a jogger or bicyclist entering an intersection falsely confident that he/she is visible to and has been seen by the driver of an approaching vehicle on a side street. Such can even lead to tragic accidents.

Another significant drawback has been that prior safety vests have been constructed in a way that does not really lend itself to their intended function. For example, the prior safety vests traditionally have been constructed from

materials better suited for other purposes, such as in fencing and bags. Because of this, the prior safety vests are not adapted to be folded and refolded for stowing, and when unfolded tend to retain their shape and have a memory that interferes with proper fit. Cracking and bleeding can and does often occur between different materials used in such vests when folded. Also, the safety vests of the prior art are not suited for repeated laundering, are not colorfast and thus tend to fade. This is not only detrimental to overall performance, but detracts from a professional appearance. An indirect result of this is that the wearer is less likely to want to wear such a safety vest.

Yet another significant drawback to the safety vests typical of the prior art is that they are not readily adjustable and even when adjusted, usually do not fit very well anyway. The prior safety vests are usually adapted to be worn over t-shirts only, and cannot easily accomodate people of different sizes wearing different outer clothing under various weather conditions. This too can contribute to a reluctance to wear such a safety vest despite the benefits of any enhanced visibility. Of course, such a safety vest cannot begin to serve its intended purpose if not worn.

A need has thus arisen for a new and unique enhanced visibility safety garment of improved construction which enhances visibility from all viewing angles, is readily adjustable to accomodate a wide range of wearers, fits better, is more durable and is less susceptible to snagging.

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Summary of Invention

The present invention comprises an improved enhanced visibility safety garment that overcomes the foregoing and other difficulties associated with the prior art. In accordance with the invention there is provided an improved type of personal protective equipment (PPE) in the form of an enhanced visibility garment comprised primarily of woven synthetic fabric reinforced with polyester straps or webbing with retroreflective strips arranged and interconnected to facilitate maximum visibility from all viewing angles and ease of adjustability to fit wearers of different sizes under various conditions. Two embodiments are disclosed.

Brief Description of Drawing

A better understanding of the invention can be had by reference to the following Detailed Description in conjunction with the accompanying Drawing, wherein:

Fig. 1 is a front view of an enhanced visibility garment incorporating a first embodiment of the invention, shown fully closed;

Fig. 2 is a view similar to Fig. 1, but showing the garment partially opened with the front and back panels folded upward;

Fig. 3 is a plan view of the outside of the garment vest shown fully opened and spread out in a flat position;

Fig. 4 is a view similar to Fig. 3, but showing the inside of the garment;

Fig. 5 is front view similar to Fig. 1, but showing the lower edges of the garment folded upward;

Figs. 6 is an illustration of an alternate type of releasable front fastener;

Fig. 7 is an illustration showing an optional releasable seam construction at the shoulder;

Fig. 8 is a front view of an enhanced visibility garment incorporating a second embodiment of the invention, shown fully closed;

Fig. 9 is a plan view of the garment shown fully opened and spread out in a flat position; and

Fig. 10 is a view similar to Fig. 9, but showing the inside of the garment of the second embodiment.

Fig. 9 is a plan view of the garment shown fully opened and spread out in a flat position; and

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Detailed Description

Referring now to the Drawing, wherein like reference numerals designate like or corresponding elements throughout the views, and particularly referring to Figs. 1 - 5, there is shown the enhanced visibility safety garment 10 incorporating a first embodiment of the present invention. The garment 10 is a form of personal protective equipment (PPE) worn like a vest, and will be referred to herein as a PPE safety garment. As will be explained more fully hereinafter, the PPE safety garment 10 comprises an engineered garment that incorporates various improvements to enhance overall performance through proper fit and comfort by the wearer, as well as enhanced visibility of the wearer by others from all viewing angles.

The PPE safety garment 10 includes a pair of front panels 12 and 14 and a rear panel 16, secured at their upper ends along sewn seams 18. Front panels 12 and 14 are symmetrical, with their upper inner edges being shaped as shown to form a V-neck opening for the head and neck of a wearer. The front panels 12 and 14 and rear panel 16 are preferably of sufficient length to cover the chest and back or torso of a wearer.

The panels 12, 14 and 16 are preferably comprised of suitable synthetic woven fabric material that is flexible but substantially inextensible. Such fabric material is especially desirable because it is lightweight, durable, supple, washable, breathable, and comfortable. Such fabric material also readily conforms to fit the wearer. For example, a suitable woven nylon fabric such as that commercially available from DuPont under the brand name SUPPLEX, could be used.

In the preferred embodiment, panels 12, 14 and 16 are formed of VIS-TEX polyester mesh fabric available from Head Lites Corp. of St. Paul, Minnesota, the assignee hereof. Such fabric has a weight of about 3.5 ounces per yard, chromaticity coordinates per CIE 1931 of about $x=0.40$ and $y=0.52$, minimum luminance of about $Y=0.70$, and colorfastness of at least 40 AFU as per AATCC-16E-1993 test data.

If desired, the fabric of panels 12, 14 and 16 can be of a bright fluorescent color, such as yellow or orange, to enhance visibility. However, there may be applications of the PPE safety garment 10 where such a bright background color is not necessary.

Trim or binding 20 is preferably wrapped about and sewn continuously along the entire peripheral edges of the panels 12, 14 and 16 to avoid tearing and to minimize potential snagging of the PPE safety garment 10. The binding 20 is preferably comprised of a synthetic woven fabric material similar to the material of panels 12, 14 and 16.

The front of the safety garment 10 is closed and secured by a releasable fastener 22, such as a zipper. Any suitable form of releasable fastener could be used, the particular type of which is not critical to practice of the invention. For example, if desired, a hook and loop fabric fastener 24 comprising a hook tape portion 24a and a loop tape portion 24b as shown in Fig. 6, could be used instead of a zipper.

Criscrossing straps 26 and 28 are provided on the outside of panels 12, 14 and 16 for reinforcement. The straps 26 and 28 are relatively wide, and are formed from suitable synthetic webbing material. One strap 26 is provided for each front panel 12 and 14. Each strap 26 extends up the respective front panel 12 or 14, over the shoulder and down the back panel 16. As shown, each strap 26 consists of two sections, one for the front panel 12 or 14 and the other for the rear panel 16, joined by shoulder

seams 18. If desired, the straps 26 could be continuous, especially if the panels 12, 14 and 16 were formed from a single, integral piece of material. The straps 26 preferably extend from the lower edges of the front panels 12 and 14 to the lower edge of the rear panel 18. The straps 26 are preferably sewn continuously along their longitudinal edges, and across their ends, which are preferably tucked beneath edging 20, as shown, to avoid tearing and to minimize potential snagging of the PPE safety garment 10.

Strap 28 extends over straps 26 across the lower ends of the panels 12, 14 and 16. Strap 28 includes portion 28a on the rear panel 16 and two separate relatively shorter portions 28b, one on each of the front panels 12 and 14. The strap portion 28a is preferably sewn along its longitudinal edges continuously between the sides of rear panel 16 of to avoid tearing and to minimize potential snagging of the garment 10. Strap portions 28b are preferably sewn to panels 12 and 14 continuously along their longitudinal edges, and across their ends, preferably tucked beneath binding 20, as shown, for the same reasons.

Straps 26 and 28 are preferably comprised of synthetic material, such as polyester webbing, and are preferably of a

fluorescent color, contrasting to that of panels 12, 14 and 16, for enhanced visibility during daylight. For example, the panels 12, 14 and 16 could be yellow with straps 26 and 28 orange.

In the preferred embodiment, straps 26 and 28 are formed of VIS-MAT polyester webbing also available from Head Lites Corp. of St. Paul, Minnesota, the assignee hereof. Such material is about 4.5 inches wide with chromaticity coordinates per CIE 1931 of about $x=0.60$ and $y=0.35$, minimum luminance of about $Y=0.35$, and colorfastness of at least 40 AFU as per AATCC-16E-1993 test data.

Strips 30 of retroreflective material are provided on each strap 26 and 28 for further enhancing visibility by others of the wearer of PPE safety garment 10, particularly under low light conditions. As shown, two strips 30 are provided on each strap 26 and 28, however, one or more may be used. The strips 30 are preferably located inwardly of the edges of the respective straps 26 and 28 to provide a contrasting background effect over the straps against the panels 12, 14 and 16. The strips 30 are comprised of suitable retroreflective material continuously secured along their lengths to straps 26 and 28.

In the preferred embodiment, strips 30 are formed of # 8710 or 8725 SCOTCHLITE brand material available from 3M Company of St. Paul, Minnesota, about 0.75 to 1.00 inch wide, heat fused continuously along their entire lengths and typically located at least about 0.25 inch inwardly from the edges of straps 26 and 30.

The sides of the PPE safety garment 10 are secured by releasable fasteners 32. Any suitable releasable fastener can be used. In the preferred embodiment, hook and loop fasteners are used, with multiple hook tape portions 32a being provided on the inside of the free ends of strap portions 28a and associated loop tape portions 32b being provided on the strap portions 28b as shown. This allows a wide range of adjustability to accomodate differently sized wearers and any outer garments over which vest 10 is to be worn. This also facilitates adjustment even with cold or gloved hands.

Optional mating snaps 34 and 36 may be provided on the front panels 12 and 14 and the rear panel 16 for adjusting the length of PPE safety garment 10, according to the torso length of the wearer or to avoid interference with equipment worn on the wearer's belt. This is important, for example, in public safety or law enforcement applications where

belts and must have ready and unobstructed access to such equipment. Fig. 5 shows the PPE safety garment 10 with both front panels 12 and 14 and the rear panel 16 folded up and releasably secured with snaps 34 and 36.

If desired, an optional pocket 38 can be provided on the inside of the PPE safety garment 10, as best seen in Fig. 4, along with a label 40 with printed instructions for the proper use, care and cleaning thereof, together with any performance data.

If desired, an optional strap 42 can be provided on one of the front panels 12 and 14, for use as a microphone clip such as in public safety or law enforcement applications.

In some applications, it may be desirable to provide the PPE safety garment 10 with at least one releasable seam or breakaway shoulder fastener 44 as shown in Fig. 7, such as for example in the event the wearer becomes hung up or snagged on something. Any suitable releasable fastener may be used at the shoulder seams 18. For example, hook and loop fasteners may be used, with multiple longitudinal hook tape portions 44a being provided on the upper edge of the rear panel 16 and an associated lateral loop tape portion 44b being provided on front panel 12 and/or 14.

Referring now to Figs. 8-10, there is shown a PPE safety garment 50 incorporating a second embodiment of the invention. The safety garment 50 includes numerous component parts that are substantially identical in construction and function to those of garment 10 of the first embodiment. The same reference numerals have been used to identify such component parts in garment 50, but with prime (') notations for differentiation.

The primary distinction between the embodiments comprises the fact that PPE safety garment 50 utilizes a different side closure arrangement. In garment 50, the straps 28 are adapted to accomodate a belt. In particular, strap portions 28a' do not extend beyond the sides of the rear panel 16' and are secured only along their longitudinal edges, and not across their ends, so as to form a guideway or channel for a belt 52, the opposite ends of which extend through strap portions 28b which are similarly secured to the front panels 12' and 14', for releaseable connection by buckle 54. Belt loops 55 are also provided on front panels 12' and 14', as shown. Any suitable buckle can be used. For example, a buckle and strap arrangement like that shown in U.S. Pats. 4,150,464 and 4,171,555, the disclosures of which are incorporated herein by reference, can be used. If

desired, an optional pair of straps 56 can be provided on one of the front panels 12' or 14' for attachment of an identification tag, for example.

From the foregoing, it will thus be understood that the present invention comprises a new and unique type of personal protective equipment in the form of an enhanced visibility safety garment having several advantages over the prior art. One significant advantage is that the safety garment herein allows the wearer to be more easily seen by others from all viewing angles under various lighting and weather conditions. Another significant advantage is that it is easily adjustable to accomodate and properly fit wearers of different sizes over various outer garments. The PPE safety garment herein is an engineered garment constructed of materials with coordinated characteristics that function to maximize overall performance, while worn or stowed, even after repeated washings, with a professional appearance to enhance pride by wearers and encourage its use. Other advantages will be evident to those skilled in the art.

Although particular embodiments of the invention have been illustrated in the accompanying Drawing and described in the foregoing Detailed Description, it will be understood

that the invention is not limited only to the embodiments disclosed, but is intended to embrace any equivalents, modifications and/or rearrangements of elements falling within the scope of the invention as defined by the following Claims.

18

18